

DRAFT

RBT 04261 and 04262

Basalt

78.8 and 205 grams



Figure 1: RBT04262 on ice.

RBT 04...



Figure 2: Laboratory photographs of two specimens of olivine-phryic basaltic shergottite (McBride et al. 2007). Cube is 1 cm.

Introduction

These two identical pieces of basaltic shergottite were found together on the ice (figure 1) in Antarctica in 2004, but weren't announced until 2007. The location is termed Roberts Massif. Oxygen isotopes indicate that they are Martian (McBride et al. 2007).

Petrography

Brief descriptions of RBT04261 are found in McBride et al. (2007) and Connolly et al. (2007). About half of

the exterior surfaces have a brown/black, rough-textured fusion crust. The interiors are soft and tan-grey in color with a sandy texture and low metal content (figure 2). Thin sections show a coarse-grained assemblage of pyroxene, olivine and maskeyenite (grain size about 4 mm)(figure 3). Shock-melt veins and pockets are present.

Anand et al. (2008), Dalton et al. (2008) and Mikouchi et al. (2008) have all studied the petrology of

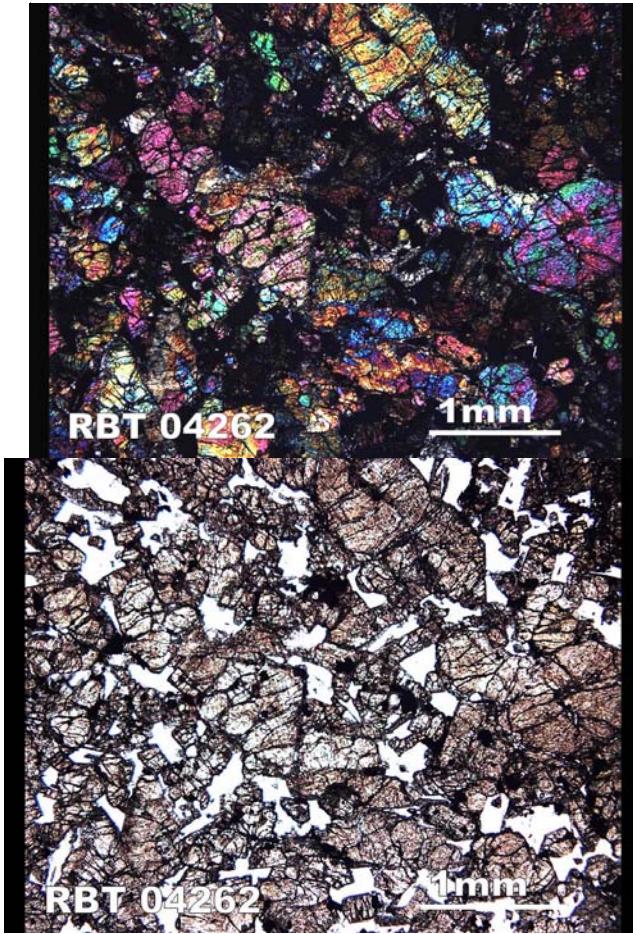


Figure 3: Thin section photos of RBT04261 (from McBride et al. 2007).

RBT04262. They find these rocks are made up of two distinct regions: a poikilitic region defined by large (5 mm) low-Ca pyroxene oikocrysts including small olivine chadocysts, chromites and melt inclusions and a non-poikilitic region with intergrowths of maskelynite, olivine, pyroxene, phosphates, chromite, ilmenite and sulfides. Anand et al. consider RBT04262 to be an olivine cumulate and, indeed, “ghosts” have been reported in P scans of olivine (Beckett et al. 2008).

Chemistry

The chemical composition of RBT04262 has been reported by Anand et al. (2008). The REE pattern is essentially flat, like that of Shergotty, but lower (figure 5).

Radiogenic age dating

RBT04262 has been successfully dated by the Lu-Hf technique with an age of 225 ± 21 m.y. (Lapan et al. 2008)(figure 6).

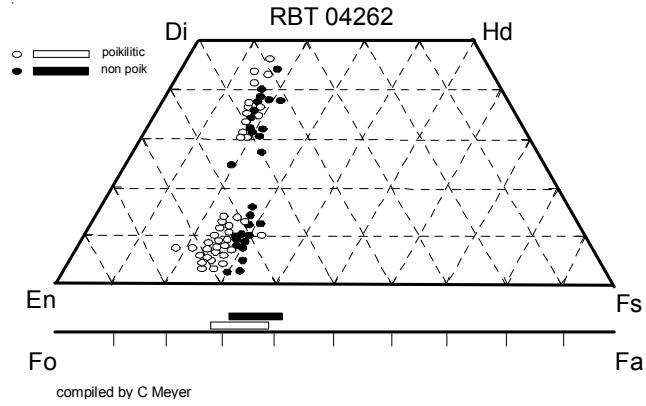


Figure 4: Olivine and pyroxene composition diagram (redrawn from Mikouchi et al. 2008).

Mineralogical Mode for RBT04262

Mikouchi 2008

Olivine	30 %
Pyroxene	
Pigeonite	43
Augite	10
Plagioclase	13
Chromite	2
Phosphate	1
Other	1

Other Studies

Oxygen isotopes are reported by McBride et al. (2007) and Anand et al. (2008). Sulfur isotopes are reported by Franz et al. (2008). Xenon isotopes were reported by Cartwright et al. (2008).

Summary of Age Data for RBT04262

Lu-Hf
Lapan et al. 2008 225 ± 21 m.y.

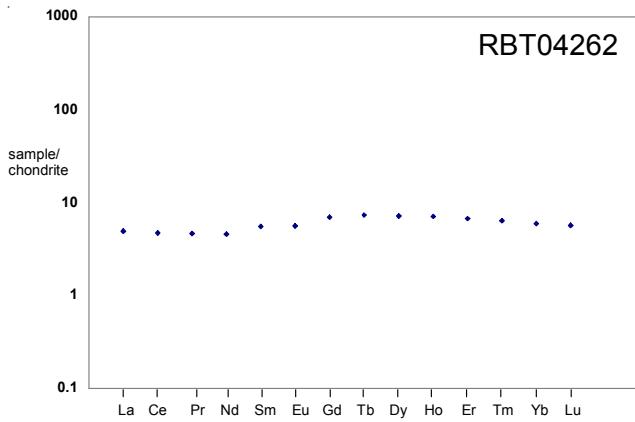


Figure 5: Normalized rare-earth-element diagram for RBT04262 (data from Arnand et al. 2008).

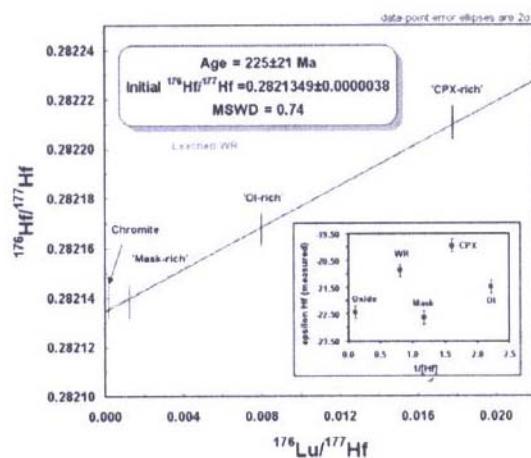


Figure 6: Lu-Hf isochron diagram for RBT04262 (Lapan et al. 2008).

Table 1. Chemical composition of RBT 04262.

reference	Anand2008	
weight		
SiO ₂ %	47.6	(a)
TiO ₂	0.43	(a)
Al ₂ O ₃	3.32	(a)
FeO	20.6	(a)
MnO	0.53	(a)
MgO	21.6	(a)
CaO	5.66	(a)
Na ₂ O	0.59	(a)
K ₂ O	0.08	(a)
P ₂ O ₅	0.39	(a)
S %	0.17	(b)
sum		
Sc ppm	31	(b)
V	218	(b)
Cr	7152	(b)
Co	63	(b)
Ni	291	(b)
Cu	6.6	(b)
Zn	74	(b)
Ga	8.2	(b)
Ge ppb		
As		
Se		
Rb	4	(b)
Sr	22.2	(b)
Y	9.3	(b)
Zr	23	(b)
Nb		
Mo	0.4	(b)
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb	42	(b)
In ppb		
Sn ppb	110	(b)
Sb ppb	83	(b)
Te ppb		
Cs ppm	0.29	(b)
Ba	12.8	(b)
La	1.15	(b)
Ce	2.81	(b)
Pr	0.414	(b)
Nd	2.07	(b)
Sm	0.81	(b)
Eu	0.314	(b)
Gd	1.36	(b)
Tb	0.26	(b)
Dy	1.75	(b)
Ho	0.4	(b)
Er	1.07	(b)
Tm	0.155	(b)
Yb	0.96	(b)
Lu	0.145	(b)
Hf	0.97	(b)
Ta		
W ppb	380	(b)
Re ppb		
Os ppb		
Ir ppb		
Pt ppb		
Au ppb		
Th ppm	0.257	(b)
U ppm	0.058	(b)
technique:	(a) ICP-AES, (b) ICP-MS	

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